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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Paper No. 19

Application Number: 09/846,255
Filing Date: May 2, 2001
Appellant(s): KIKUCHI ET AL

Harris Pitlick
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 11/17/03.

(1) Real Party in Interest

A statement identifying the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

A statement identifying the related appeals and interferences which will directly affect or be directly affected by or have a bearing on the decision in the pending appeal is contained in the brief.

(3) Status of Claims

The statement of the status of the claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Invention

The summary of invention contained in the brief is correct.

(6) Issues

The appellant's statement of the issues in the brief is correct.

(7) Grouping of Claims

The appellant's statement in the brief that certain claims do not stand or fall together is not agreed with because Appellant states merely points out the differences in what the dependent claims cover and does not provide an argument as to why the claims are separately patentable as required by 37 CFR § 1.192 (c)(7). 37 C.F.R. § 1.192 (c) (7) states that the Appellant must "explain why the claims of the group are believed to be separately patentable. Merely pointing out the differences in what the claims cover is not an argument as to why the claims are separately patentable."

(8) Claims Appealed

The copy of the appealed claims contained in the Appendix to the brief is correct.

(9) Prior Art of Record

5635102	Mehta	6-1997
5922624	Verhaverbeke et al	7-1999

(10) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claims 1-3 and 5-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mehta ('102) as applied to claim 1 above, and further in view of Verhaverbeke et al ('624). This rejection is set forth in prior Office Action, Paper No. 16.

In reference to claim 1, Mehta teaches a method comprising:

Bringing a mixed gas of anhydrous HF gas and a heated inert gas into contact with a substrate surface such that at least a portion of a low-density film is removed without impairing a high density film beyond a tolerance (Abs., Lines: 1-28) wherein the mixed gas does not contain steam (Col.6, lines: 10-15).

However, Mehta fails to teach applicant's amended claim limitation by continuously exposing the anhydrous gas in contact with the substrate. Applicant argues that the scope of his "continuously exposing" claim language does not encompass continuously exposing through pulsing gas as taught by Mehta.

Verhaverbeke et al ('624) teaches that HF vapor etching is performed in dynamic mode, which is a mode where the process gases are continuously forming (Col.3, lines: 20-21).

It would have been obvious to one of ordinary skill in the art to modify Mehta's teachings to include a dynamic mode (continuous flow) of vapor etching as taught by Verhaverbeke because Verhaverbeke teaches that the pulsing (static mode) or continuous flow (dynamic mode) may be used to selectively etch silicon oxides and further that the well known continuous flow of gases reduce processing times through evacuation/etch cycling (See Verhaverbeke Col.3, lines: 20-27- teaching that the method may be used to etch (hence remove) silicon oxide films and line: 20- which teaches static or dynamic processes may be implemented to etch silicon oxide).
In reference to claim 2, Mehta teaches wherein the high density film is necessary for the substrate and the low density film is not (Col.1, lines: 28-32).

In reference to claim 3, Mehta teaches wherein the low density film has impurities which are removed with the film (Abs., lines:20-28).

In reference to claim 5, Mehta teaches wherein the substrate is Si, the high density film is a thermal oxide film and the low density film is a natural oxide film formed on the substrate or an oxide film formed with a chemical solution (Abs., lines: 20-28 and Col.1, lines: 5-32).

In reference to claim 6, Mehta teaches wherein the substrate is for a semiconductor device (Abs., lines: 18-25).

In reference to claim 7, Mehta teaches wherein the high density film is formed on the substrate via a substrate layer (Col.5, lines: 20-40).

In reference to claim 8, Mehta teaches wherein the mixed gas is maintained at a temperature between room temperature and 200 degrees C (Col.4, lines: 5-15).

In reference to claim 9, Mehta teaches wherein the mixed gas is maintained at a temperature between room temperature and 100 degrees C (Col.4, lines: 5-15).

In reference to claim 10, Mehta teaches wherein the surface of the substrate is between 30 and 50 degrees C (Col.4,lines: 10-15).

In reference to claim 11, Mehta teaches wherein the mixed gas has a flow rate between 40 to 60 L/min (col.4, lines:15-25).

In reference to claim 12, Mehta teaches wherein the concentration of anhydrous HF gas is in the range of 1 vol. % to 3 vol. % (Col.4, lines: 25-30).

In reference to claim 13, Mehta teaches wherein the concentration of anhydrous HF gas is in the range of 1.5 vol. % to 2 vol. % (Col.4, lines: 25-30).

In reference to claim 14, Mehta teaches wherein the high density film is a thermal oxide film and is removed in an amount of 0 to not greater than 0.2 nm (Col.5, lines: 1-10).

(11) Response to Argument

The Appellant's arguments concede that Mehta ('102) teaches all the limitations of claim 1 except Mehta fails to "**continuously**" bring a mixed gas of anhydrous HF gas and heated inert gas into contact with the substrate surface as defined by the Appellant in Paper No. 7. Mehta teaches that the etch chemistry be applied in a pulsed (static mode) manner which means that the mixed gas is turned on and off and does not flow "continuously" as claimed. The Examiner agrees with this assessment of the Mehta reference.

The point of contention lies with the Verhaverbeke et al ('624) reference that is used to support the Examiner's finding of obviousness. Verhaverbeke teaches a very similar method including the formation of low and high density films, which is etched by anhydrous HF. Verhaverbeke teaches that traditionally HF dry etching is performed by continuously flowing the etch gas (dynamic mode) (Col.2, lines: 1-13). Verhaverbeke teaches further that either a dynamic or static mode may be implemented for anhydrous etching of silicon oxide films (See Col.3, lines: 20-27, see also claims 11 and 12.

The Appellant disagrees with the Examiner's finding of obviousness and argues that Verhaverbeke describes the use of pulsed gases (static mode) is an improvement to address controllability problems with the continuous flow process. The arguments assert that this constitutes a "teaching away" from the dynamic mode. However it should be noted that, Verhaverbeke also teaches that the static mode still has controllability problems as well (Col.2, lines: 10-13). Therefore Verhaverbeke teaches both methods have draw backs and the two methods are known and interchangeable(Col.3, lines: 20-27, see also claims 11 and 12).

Most importantly, Verhaverbeke does not teach away from using dynamic mode, Verhaverbeke actually *claims* that his process may be performed in dynamic mode or static mode (see claims 12 and 11).

Appellant argues that the dynamic mode does not equate to continuous flow of gases and that there is no evidence of record to support this. This is not persuasive because Verhaverbeke et al teaches on Col.2, line 5 that the process gases are continuously flowing, the so-called dynamic mode. This is demonstrating what is known in the art. This is further substantiated by Westendorp US 5167761 (see appendix), referred to by Verhaverbeke in the same paragraph which further describes the static mode as a introduction of anhydrous HF for a certain time interval and then purging after reaction (Col.3, lines: 5-40), this is the same process discussed in Mehta which introduces gases for a certain time interval, and then purges after the reaction (Abs., lines: 1-20). Therefore, it is known in the art that the dynamic mode is a process using

continuously flowing gases, as that claimed by the Appellant and defined by the Appellant in Paper No.7. Further it is known in the art that the static mode, turns off the gas flow during a reaction time and is followed by a purging step.

Appellant argues that Verhaverbeke does not support a finding of obviousness because Verhaverbeke does not teach the same etch chemistries as recited in claim 1. However, such an argument is not persuasive because the Mehta reference teaches that the Appellant's etch chemistry is not novel, the Examiner did not rely on Verhaverbeke to teach the exact etch chemistry claimed by the Appellant. The Verhaverbeke reference is relied upon to show that continuous flows of gases (dynamic mode) and pulsed flows of gases (static mode) are known in the art and interchangeable methods of introducing HF gases and therefore are not novel and would be considered obvious variations.

The Appellant argues that the etch technique taught by Verhaverbeke cannot support a finding of obviousness because it does not pertain to an anhydrous HF, without a carboxylic acid, in the absence of steam. This is also unpersuasive because Verhaverbeke does teach the use of anhydrous HF repeatedly; moreover Appellant's claim language fails to preclude the addition of a carboxylic acid, and even so Col.3, lines: 10-30 teaches an anhydrous etch without a carboxylic acid. Lastly, although Verhaverbeke fails to teach an anhydrous etch without steam as claimed by the Appellant; Mehta teaches an anhydrous etch without steam (or water vapor) as claimed by the Applicant (Col.6, lines: 10-15).

Appellant argues that the Examiner fails to comment on the comparative examples of record, which demonstrate a significant difference between the present continuous mode compared to the pulsed mode of Mehta. However, according to the MPEP § 716.02(b) "the Appellant has the burden of explaining the data that they proffer as evidence of non-obviousness". The Appellant has failed to point out specifically what comparative examples within the record constitute evidence and how such evidence provides a basis of nonobviousness. Therefore such an argument is not persuasive.

The Examiner failed to find any data submitted showing unexpected results by the Applicant. The specification contains an assertion that the continuous flow of gases reduces the time requirements for etching; however such an assertion is not persuasive against a finding of prima facie obviousness because Appellant is merely reciting a known result of a continuous etch process. Westendorp et al (US 5167761- referred to in the Verhaverbeke –Col.2, line: 10) describes that the continuous (dynamic mode) has a reduced etch time compared to that of the static mode (Col.1, lines: 35-40 and Col.2, lines: 25-30). Therefore, the Appellant's results are entirely expected and known and do not substantiate a finding for patentability. (See MPEP § 2145, see also Ex parte Obiaya, 227 USPQ 58, 60 (Bd. Pat. App. & Inter. 1985 which states "the fact that appellant has recognized another advantage which would flow naturally from following the suggestion of prior art cannot be the basis for patentability when the differences would otherwise be obvious.")

Lastly, Appellant implies that his combination of Mehta's etch chemistry with the conventional application of a continuous flow of gases as taught by Verhaverbeke does not produce the Appellant's improved results. This argument is not persuasive, however Appellant has provided no evidence of record as required to combat a prima facie case of evidence (see MPEP §. 716.01 (c), see also In re Schulze, 346 F.2d 600, 602, 145 USPQ 716, 718 (CCPA 1965)– which states that "arguments of counsel cannot take the place of evidence in the record."). Moreover, MPEP § 716.02(b) establishes that the Appellant carries the burden to establish unexpected significant results.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

LMS
May 31, 2004

Conferees

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APPENDIX